GROUP 55

HEATER, AIR CONDITIONER AND VENTILATION

CONTENTS

GENERAL

M2551000100351

As for heater and air conditioner/ventilation system, a heater and an air conditioner are available. The heater unit integrates the heater, blower, and cooling unit, and features compact and lightweight structure. The air conditioner system incorporates a semiautomatic air conditioner with 5-cylinder single swash plate type continuous variable displacement compressor.

FEATURES

IMPROVEMENTS IN COMFORT

- Adoption of low noise, large air volume heater and air conditioner system
- Adoption of smaller air intake box for larger passenger leg space.
- Adoption of rear heater duct for improved rear seat passengers' comfort.
- A clean air filter with deodorant function (option) has been adopted for cleaner air in the compartment.

FOR IMPROVED APPEARANCE

- Translucent dials on the A/C control panel match the audio system design.
- Silver dials for improved appearance

IMPROVEMENTS IN OPERATION PERFORMANCE

- Dials are illuminated while the lighting switch is on for improved operability during nighttime.
- Inside/outside air selection switch has been changed to a pushbutton switch.

RELIABLE VISUAL FIELD (IMPROVEMENT IN SAFETY)

- Current type defroster nozzle has been adopted to improve defogging performance (Shortens windshield fogging time).
- Defroster vents with guide fins have been adopted to secure better defogging pattern.

IMPROVEMENTS IN FUEL ECONOMY

- Wider condenser area reduces load to the air conditioner and improves fuel consumption.
- Compact, lightweight heater unit and cooling unit have been adopted.
- A 5-cylinder continuous variable displacement compressor that incorporates power-saving, compact, lightweight single swash plate mechanism has been adopted.
- Reduced numbers of wirings and lighter vehicle weight from installation of CAN communication system

GLOBAL ENVIRONMENT PROTECTION

Adoption of HFC134a for refrigerant.

IMPROVEMENTS IN SERVICE QUALITY

- Reduction of refrigerant gas leakage and improvement in serviceability by incorporating condenser and receiver
- Clean air filter replacement procedure has been simplified.

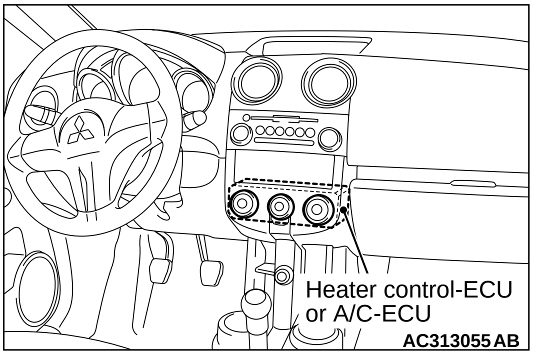
RESPONSIBILITY IMPROVEMENT

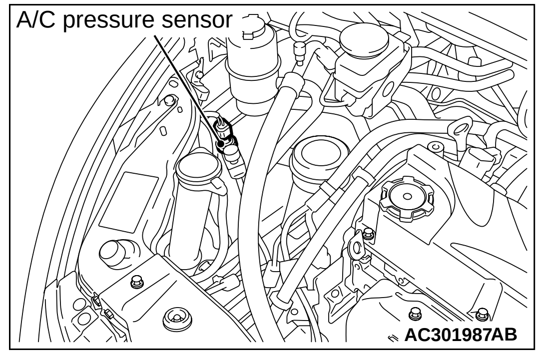
Reliable information transmission is achieved by connecting A/C-ECU and each ECU via CAN communication.

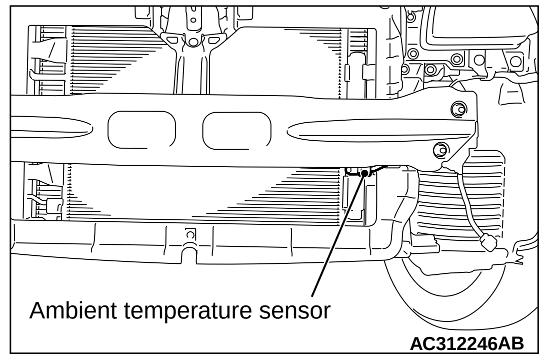
SPECIFICATIONS

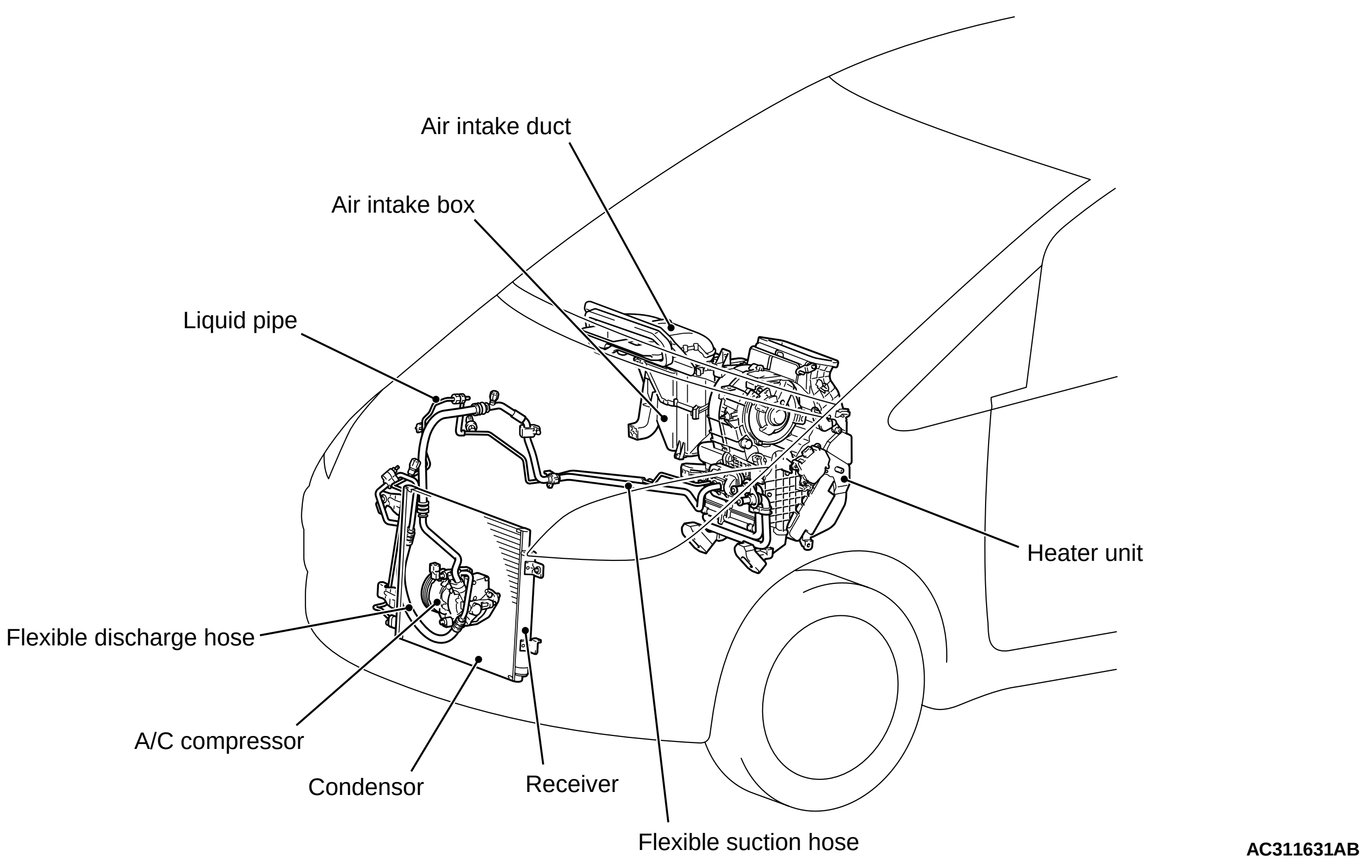
Item		Specification
Heater control type		Rotary type
Air conditioner	Heating capacity (W)	5140
	Cooling capacity (W)	4300
Compressor type		5SE09C
Refrigerant	Type	HFC134a
	Charge quantity g	430 ± 20

CONSTRUCTION DIAGRAM





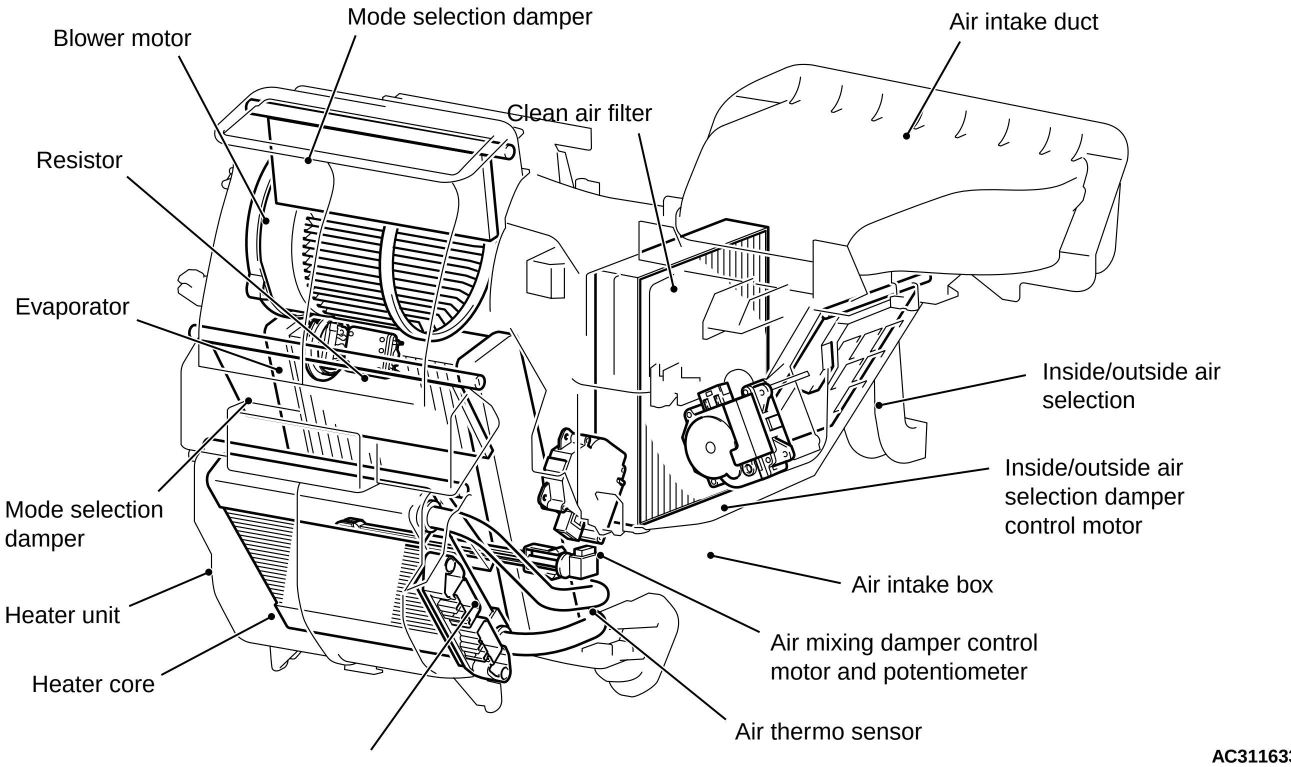




HEATER UNIT

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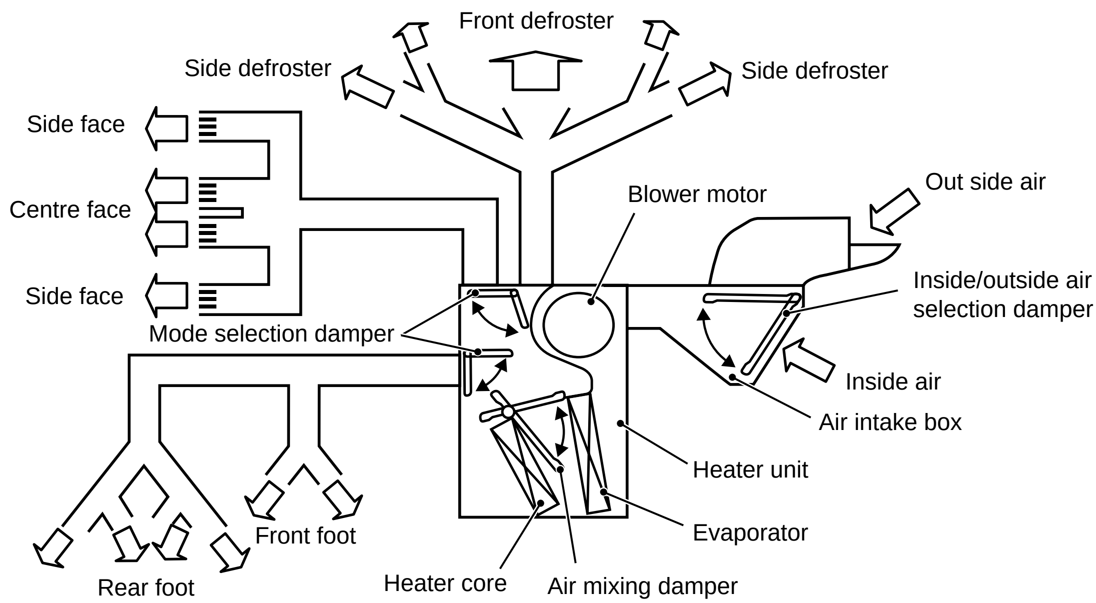
HEATER UNIT



The following blower unit and the heater unit have been adopted.

- The heater unit integrates the heater, blower, and cooling unit for reduced weight and size.
- Smaller air intake box has been adopted for larger passenger leg space.
- Clean air filter has been adopted for improved comfort. <optional>.

OPERATION

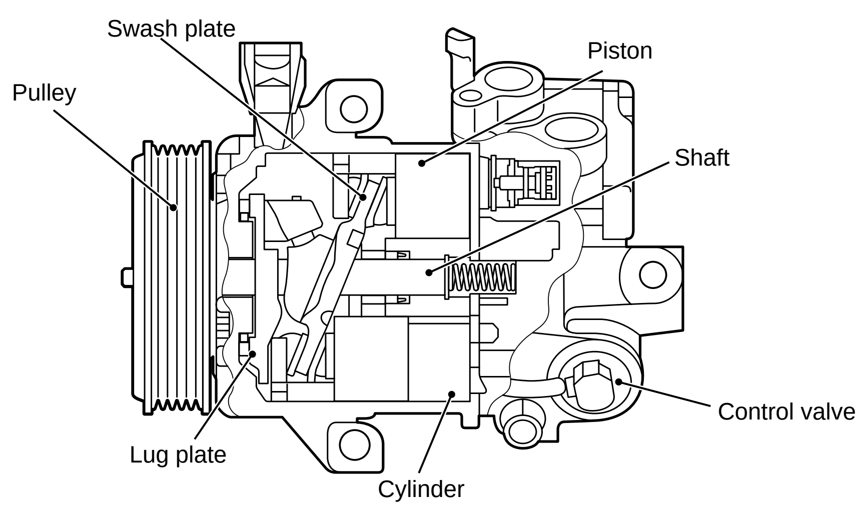


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COMPRESSOR

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EXTERNALLY-CONTROLLED, 5-CYLINDER, CONTINUOUSLY VARIABLE DISPLACEMENT COMPRESSOR



AC312093AB

Control valve

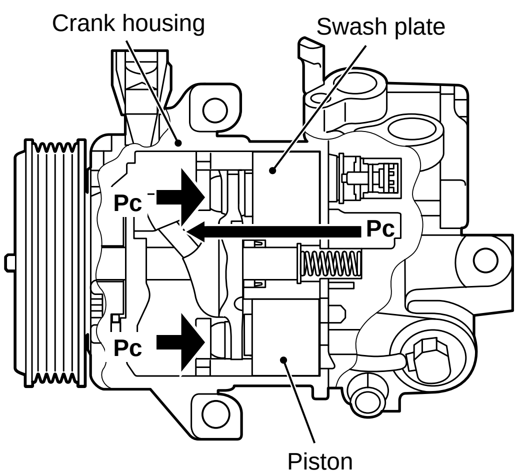
The control valve controls the pressure in the crank housing via the current value (400 Hz: Duty signal) input from the engine-ECU to change the angle of the swash plate. Consequently, the piston stroke is changed and the discharge amount can be continuously controlled. In addition, the compressor requires no magnetic clutch, because the displacement can vary between 0 – 100% by tilting the swash plate.

Pulley

A resin DL pulley has been adopted to reduce the weight. The resin DL pulley incorporates the damping mechanism absorbing the torque variation of the compressor and the limiter of the belt protection mechanism activating when the compressor locks.

OPERATION

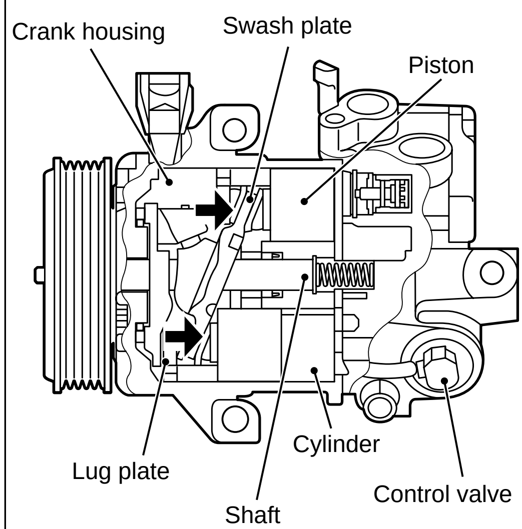
Interior temperature is low.



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If the cabin is not necessary to be cooled, the control valve introduces the pressure (Pc) to the crank housing. This will pressurise the crank housing. The pressure applied to the left side of the piston, then, will become higher than that applied to the right side of the piston, resulting in smaller tilting angle of the swash plate. This will make the piston stroke smaller.

Interior temperature is high.



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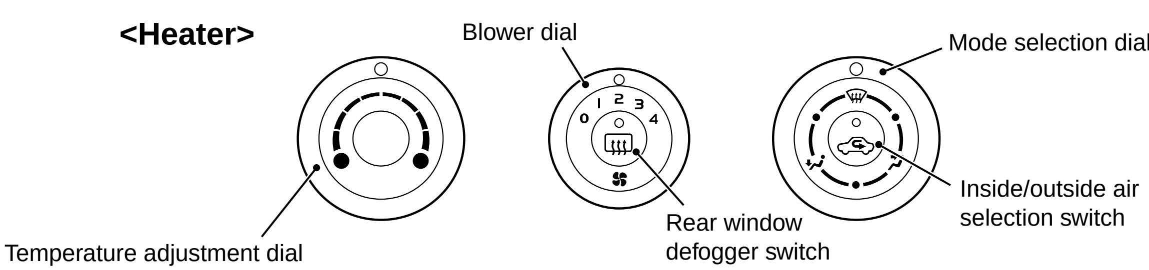
If the cabin is necessary to be cooled, the control valve interrupts the pressure (Pc) to the crank housing. This will gradually depressurise the crank housing and finally the internal pressure of the crank housing becomes equal to the low pressure. The pressure applied to the left side of the piston, then, will become lower than that applied to the right side of the piston, resulting in larger tilting angle of the swash plate. This will make the piston stroke larger.

HEATER CONTROL

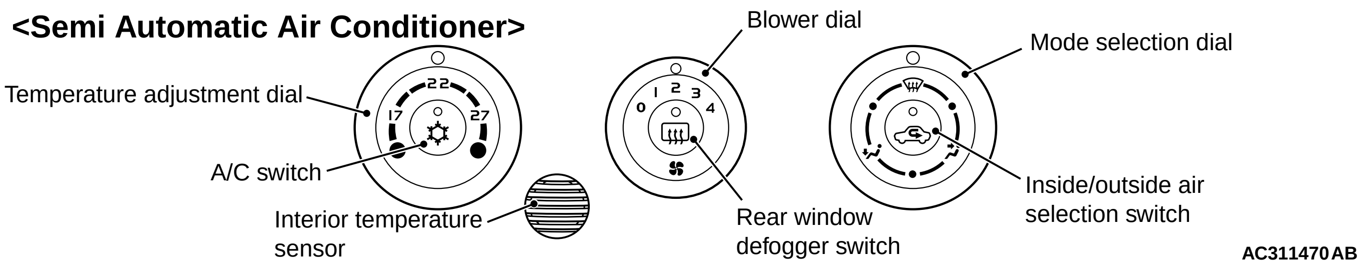
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HEATER CONTROLLER

<Heater>



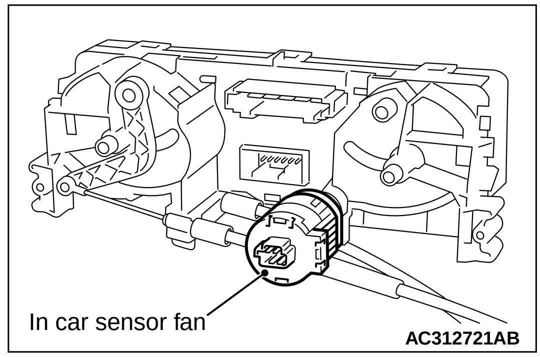
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The features of the heater controller described below are designed for better operation and easier visual recognition.

- Translucent dials on the A/C control panel match the audio system design.
- Silver dials for improved appearance.
- Inside/outside air selection switch has been changed to a pushbutton switch for easier operation.
- Dials on the control panel are illuminated while the lighting switch is ON for improved operability during nighttime.
- Interior temperature sensor has been incorporated into the heater control panel.

IN CAR SENSOR FAN



An in-car sensor fan, which aspirates the air inside the compartment and distributes the air to the interior temperature sensor, has been provided behind the heater control panel.

A/C-ECU

M2551001200049

CONTROL

FORCIBLE DEFROSTER CONTROL <WITH SEMIAUTOMATIC AIR CONDITIONER>

When the defroster vents are selected, the air conditioner is automatically turned ON. At this time, the inside/outside air selection damper is operated to the fresh-air position to defrost the windshield glass quickly.

CAN COMMUNICATION <WITH SEMIAUTOMATIC AIR CONDITIONER>

The A/C-ECU and engine A/T-ECU communicate with each other through CAN communication. The idle-up speed of the engine is controlled according to the air conditioner load to secure the cooling performance in summer driving and improve fuel consumption in seasons with moderate temperature.

NOTE: For further details on CAN, refer to P.54C-2 GROUP 54C, CAN.

REAR WINDOW DEFOGGER TIMER CONTROL

In order to prevent battery consumption, the defogger is automatically turned OFF, 20 minutes after it is turned ON.

CAN COMMUNICATION INPUT SIGNALS TABLE

Signal	Transmitter ECU
Engine speed signal	Engine-A/T-ECU
Engine coolant temperature signal	
A/C information signal	

Signal	Transmitter ECU
Ambient temperature signal	Combination meter
Vehicle speed signal	
Blower fan ON signal	ETACS-ECU

DIAGNOSTIC FUNCTION

Code No.	Diagnostic item	Substitutive value in case of diagnosis code output
B1001	Interior temperature sensor system (short circuit)	–
B1002	Interior temperature senor system (open circuit)	
B1021	Air thermo sensor system (short circuit)	–5°C
B1022	Air thermo sensor system (open circuit)	
B1084	Rear window defogger system (open circuit or short to earth)	–
B1085	Rear window defogger system (open circuit)	
B1086	Inside/outside air selection damper control motor system (open circuit or short to earth)	–
B1087	Inside/outside air selection damper control motor system (open circuit or short to earth)	
B1088	Air mixing damper control motor and potentiometer sensor system (short circuit)	–
B1089	Air mixing damper control motor and potentiometer sensor system (open circuit)	–
B1090	Air mixing damper control motor and potentiometer activating system (anticlockwise)	–
B1091	Air mixing damper control motor and potentiometer activating system (clockwise)	–
B1092	ETACS signal reception failure	–
U1073	Bus off error	–
U1100	Engine-related CAN timeout	–
U1108	Combination meter CAN communication time-out	–
U1109	ETACS-ECU CAN communication time-out	–

SERVICE DATA OUTPUT

Item No.	Check items
	Inside/outside air selection damper control switch
	Air conditioner switch
	Rear window defogger switch
	DEF Position switch
	Inside/outside air selection damper control motor (Frash) diagnosis
	Inside/outside air selection damper control motor (Recirculation) diagnosis
	Air mixing damper control motor diagnosis
	Air mixing damper control motor diagnosis

Item No.	Check items
	Rear window defogger diagnosis
	Illuminations power supply
	Pressure sensor
	Air thermo sensor
	Engine speed
	Battery voltage
	Temperature outside
	Temperature engine coolant
	Vehicle speed
	Temperature cabin
	Temperature knob
	A/C switch
	Recirculation switch
	DEF Position SW
	Air Conditioner Compressor Off: Acceleration
	Interior Fan On
	Temperature Motor Feedback
	Confirmation of A/C Status
	Illumination +
	Engine Type Information
	Engine Type Information
	Cooling Fan Level Request
	Increasing Idle Speed
	Air Conditioner On
	Refrigerant Leak
	Air Conditioner Compressor Drive Duty
	Temperature Motor Set Point
	Recirculation On
	Max hot ON
	Engine Revolution Speed
	Engine Coolant Temperature
	Ambient Temperature
	Indicated Speed

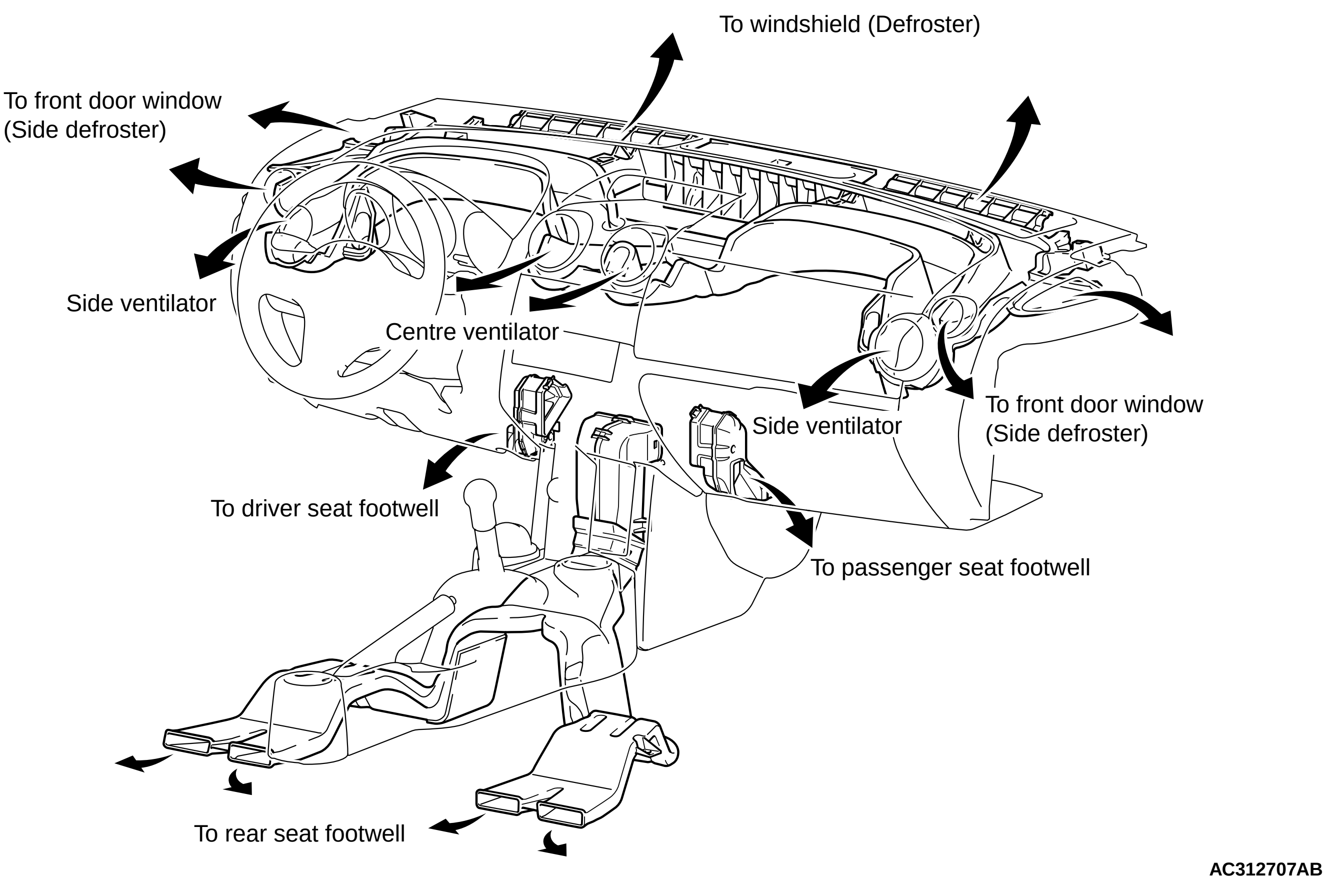
ACTUATOR TEST

Item No.	Check items
	F/R Switch LED
	A/C Switch LED
	Rear Defogger Switch LED
	Dimming

Item No.	Check items
	Rear defogger Relay
	Temperature Motor Mode
	Temperature Flap Position
	F/R Motor Mode
	Compressor Duty Cycles

DUCTS

M2551001300080



The following ventilation system has been adopted in order to improve comfortableness, appearance, and defroster performance.

- Rear heater ducts have been installed to improve rear seat comfort.
- Current type defroster nozzle has been adopted to improve defogging performance (Shortens windshield fogging time).
- Defroster vents with guide fins have been adopted to secure better defogging pattern.